

MANPRINT

(Manpower and Personnel Integration)

LTG Robert M. Elton

Deputy Chief of Staff for Personnel
United States Army
Washington, D.C.

ABSTRACT

The MANPRINT (Manpower and Personnel Integration) Program is a comprehensive program designed to enhance human performance and reliability during weapon system development with the overall goal - of optimizing total system performance. Total system performance is a function of equipment performance and human performance as they are affected under varying environmental conditions which includes physical, social and operational conditions. The challenge the U.S. Army has today is to ensure these issues are addressed early in and continuously throughout the design process.

INTRODUCTION

Each combat soldier, with his weapon, personally faces the enemy in almost any given situation. This peculiarity of the Army's mission in war gives a unique urgency to the compatibility of the soldier and his weapon through equipment designs.

In 1982 the Army Research Institute initiated a series of studies that examined the development process of several Army weapons systems. The studies examined the Stinger, Multiple Launch Rocket System (MLRS), Black Hawk (UH-60A), and the Fault Detection and Isolation Subsystem (FDIS) of the M1 tank, to determine what was done and what could be done differently to better integrate manpower and training issues. The results of this project along with other studies led to the development of the MANPRINT program.

MANPRINT (Manpower and Personnel Integration) is an Army initiative that makes the following considerations imperative in the materiel acquisition process; manpower, personnel, training, human factors engineering, system safety and health hazard assessments. The overall goal of MANPRINT is to enhance soldier performance and total system performance.

THE MANPRINT OBJECTIVE

The MANPRINT Program recognizes the soldier as the Army's most important resource and the significance of providing him quality equipment. MANPRINT's basic thrust is to maximize battlefield performance by

fielding totally integrated systems through the right mix of soldiers, hardware, and software. MANPRINT helps the Army make smart decisions by considering the "man-in-the-loop" early and continuously in the materiel acquisition process.

The Army and industry must form a partnership and take necessary actions to answer the question: Can this soldier, with this training, perform these tasks, to this standard, under these conditions. Our fighting forces are only as effective as the ability of man to operate the varied items of equipment furnished.

THE CHALLENGE

The Army challenge is to get the greatest total system performance and force effectiveness from the dollars it is spending. This includes husbanding critical resources so they are not wasted by acquiring highly sophisticated technology which exceeds the bounds of human performance. Increasingly, the Army has decided it must rely on engineering and technology to obtain advances in capability needed to meet the threat. The Army has looked toward technology to replace people whenever possible in the interest of generating more combat capability with the proper distribution of manpower resources.

Previously developed materiel systems have not performed in the field as designed or desired because they were not designed with adequate

considerations of the performance capabilities and limitations of their operators, maintainers, and support. The Dragon Antitank Weapon System, developed in the 1960's and fielded in 1971, had several deficiencies in human factors engineering and training strategy. The weapon was designed to be supported on a bipod mount and the gunner's shoulder. This arrangement subsequently proved to be unstable, which contributed to gunner tracking errors. Factors that effected tracking accuracy included gunner induced movement of the missile launcher from breathing pattern, weight shift off the shoulder at time of firing, and flinching from noise, blast and recoil. The Army has attempted to overcome these problems through training programs and training devices, with only marginal success.

High technology need not equate to complexity. Humans and machines are different and each has a role to play in the total system. It is essential that there is complete cooperation from the conceptual stage between the design engineering team and the user, each of whom must understand the other's problems. The human factors engineer must be allowed to participate in the initial layout with the design engineer. He must be recognized as an equal partner in system (design).

A successful design results when both the design engineer and the human factors engineer have been educated in the concept of system operation. It is important they are able to discuss and recognize the careful allocation of functions among humans and machines. The Army will no longer allow the indiscriminate off loading of tasks on human operators and maintainers.

THE MANPRINT TEAM

MANPRINT goals can only be accomplished through close cooperation between industry and the Army. To accomplish these goals, the Army community the combat developers, materiel developers, trainers, testers, evaluators, logisticians and engineers have joined together in a cohesive effort to coalesce user and developer MANPRINT concerns.

The key to success, is communication between the Army and the contractor. The contractor must deliver products that meet the Army's MANPRINT needs by producing a weapon system design that reflects human performance and human reliability in relationship to total system performance. The human factors engineer is charged with ensuring that the MANPRINT elements are included in all phases of systems development. The human factors engineer is the soldiers' engineer - he represents both the user and the engineering community.

MANPRINT IMPLEMENTATION

The MANPRINT Program will affect contractors in several important ways. MANPRINT criteria and constraints will be defined clearly in requests for proposals and statements of work. Competing contractors will have to demonstrate specified performance with "man-in-loop" before the final selection of the winning contractor is made. If for example, a proposal deals adequately with questions about personnel skills, training requirements, manpower and human factors engineering, the bid will be highly rated.

The Army has developed guidelines for putting MANPRINT requirements in contractual documents. Contracts will be monitored closely to verify compliance with these requirements. Source selection evaluation boards will include MANPRINT as a priority evaluation area. Industry responses to more stringent MANPRINT requirements will be evaluated. Army decision makers will expect clear and convincing evidence from both the contractual effort, and test and evaluation to demonstrate that human performance and reliability requirements are achieved and make their proper contribution to total system performance.

All design decisions are influenced by the four factors in system acquisition - cost, schedule, performance and supportability. But the basic issue is, should the Army select a system which is higher in RDT&E and procurement cost but can be operated by the soldiers on hand today, or should we select a lower RDT&E and

procurement cost system that requires highly skilled and additional personnel?

MANPRINT INITIATIVES

The Army is serious with regard to this initiative. The soldier is our most important asset. Briefings within Army, industry visits and conferences; articles and news releases; MANPRINT applications - the LHX Helicopter, are some of the methods that the Army has been using to make personnel involved in the materiel acquisition process knowledgeable about MANPRINT. It is important that the Human Factors Engineers understand the Army is earnest about MANPRINT. The Army has rewritten regulations to institutionalize MANPRINT throughout the materiel acquisition process. And, most important, MANPRINT needs and constraints will be included in requests for proposals as government furnished data.

CONCLUSION

MANPRINT is an Army program to maximize soldier-machine effectiveness in new systems and reduce demands on personnel and training resources. Success will be assured through the Army's corporate commitment, improved analytical tools, strong technology base programs, an informed and educated materiel development community - both Army and industry, and not the least, a strong MANPRINT team. With a concerted effort, MANPRINT will improve the effectiveness of our Army of excellence.

REFERENCES

1. Army Regulation 602-2, Manpower and Personnel Integration (MANPRINT) in the Materiel Acquisition Process, HQDA, Washington, DC.
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3. Meister, David, Behavioral Analysis and Measurement Methods, New York, NY, John Wiley & Sons, 1985.